CLAIMS

WHAT IS CLAIMED IS:

1. A method for setting coarse GPS time in a GPS receiver comprising:
    a) requesting a sequence of predicted navigation bits;
    b) receiving the predicted navigation bits;
    c) saving a time of receipt of the navigation bits;
    d) locating a predicted time indicator field within the predicted navigation bits;
    e) determining a coarse time setting in response to the located time indicator field; and
    f) setting coarse GPS time within the GPS receiver responsive to the difference between the coarse time setting and the time of receipt.

2. The method of claim 1 further comprising performing a Pattern Match Algorithm to provide precise GPS time.

3. The method of claim 1 further comprising:
    a) determining an expected error in the coarse time setting; and
    b) setting coarse GPS time within the GPS receiver taking into account the expected error in a GPS clock.

4. The method of claim 1 wherein the predicted navigation bits are received in a format that includes a plurality of frames, each frame organized into a plurality of subframes, each subframe having the time indicator field and including at least one subframe of predicted navigation bits; the method further comprising:
    locating the predicted time indicator field within at least one subframe of the predicted navigation bits; and
    calculating the coarse GPS time from the predicted time indicator.

5. The method of claim 1 wherein the predicted navigation bits field is transmitted with a data length that specifies the length of the sequence of predicted navigation bits, and a Reference Bit Number that designates the location of a predicted navigation

bit within a frame of actual navigation bits, the method further comprising:

determining a location within a frame of actual navigation bits, of a first bit within the sequence of predicted navigation bits based on the value of the Reference Bit Number and the data length;

locating the time indicator field within the predicted navigation bits based on the value of the Reference Bit Number;

decoding the located time indicator field to provide a predicted time indicator;

determining the coarse GPS with respect to the time at which the first bit of the sequence of predicted navigation bits was received; and

coincident with the first bit of the sequence of predicted navigation bits, setting coarse GPS time within the GPS receiver.

6. The method of claim 1 wherein the MS and the base station are communicating using a GSM system.

7. A mobile station for determining position utilizing periodically transmitted navigation bits from a plurality of SVs synchronized with GPS time, the periodically transmitted navigation bits including a time indicator field, the mobile station also communicating with one or more base stations and a position determining entity (PDE) comprising:

a two-way communication system for communicating with the base stations and the PDE;

a position location system that includes a GPS clock;

means for requesting an assistance message from the PDE, the assistance message including a sequence of predicted navigation bits sent from the base station approximately synchronized in time with GPS time;

means for saving a time of receipt of the assistance message;

means for locating the predicted time indicator field within the predicted navigation bits;

means, responsive to the located time indicator field, for determining a predicted Time of Week; and

means for setting coarse GPS time within the GPS receiver responsive to the predicted Time of Week and the time of receipt.

8. The mobile station of claim 7 further comprising means, responsive to the coarse GPS time and the predicted navigation bits, for performing a Pattern Match Algorithm to provide precise GPS time.

9. The mobile station of claim 7 further comprising:

means for determining an expected error in the Time of Week; and

the means for setting coarse GPS time within the GPS receiver includes means for setting the expected error in a GPS clock.

10. The mobile station of claim 7 wherein the transmitted navigation bits have a format including a plurality of frames, each frame organized into a plurality of subframes, each subframe having a time indicator field, and the assistance message includes at least one subframe of predicted navigation bits, and further comprising:

means for locating a predicted time indicator field within a subframe of the predicted navigation bits; and

means for calculating the Time of Week responsive to the predicted time indicator.

11. The mobile station of claim 10 wherein the assistance message includes a data length field that specifies the length of the predicted navigation bits, and a Reference Bit Number that designates a bit within a frame of the actual navigation bits, and further comprising:

means, responsive to the Reference Bit Number field and the length field, for determining a First bit of the sequence of predicted navigation bits that corresponds to the position of the first bit of the sequence within a frame of actual navigation bits;

means, responsive to the position of the first bit of the sequence of predicted navigation bits, for locating a time indicator field within the predicted navigation bits;

means, responsive to the predicted time indicator, for determining a Time of Week at the first bit of the sequence of predicted navigation bits; and

means for setting coarse GPS time within the GPS receiver coincident with the first bit of the sequence of predicted navigation bits and responsive to the Time of Week.

12. A method for synchronizing a GPS receiver with coarse GPS time in a mobile station (MS) communicating with a base station and a position determining entity (PDE) using the IS-801 standard, the GPS receiver configured to receive periodically transmitted navigation bits from a plurality of SVs synchronized with GPS time, the transmitted navigation bits having a format including a plurality of frames, each frame organized into a plurality of subframes, each subframe having a SUB-FRAME COUNT message, comprising:

by the MS, requesting a Sensitivity Assistance (SA) message from the PDE, the SA message including

a Predicted Navigation Bits field that includes a sequence of predicted navigation bits including at least one subframe,

a Data Record Size field that specifies the length of the Predicted Navigation Bits field, and

a Reference Bit Number field that designates a bit within a frame of the actual navigation bits, thereby associating the predicted navigation bits with a group of navigation bits;

responsive to the request from the MS, sending the SA message from the base station approximately in time with GPS time;

receiving the SA message in the MS, and saving a time of receipt of the SA message;

responsive to the Reference Bit Number field and the Data Record Size field, determining a first bit of the sequence of predicted navigation bits that corresponds to the position of the first bit of the sequence within a frame of actual navigation bits;

responsive to the position of the first bit of the sequence of predicted navigation bits, locating the SUB-FRAME COUNT field within the predicted navigation bits;

decoding the located SUB-FRAME COUNT field to provide a predicted SUB-FRAME COUNT value;

responsive to the predicted SUB-FRAME COUNT value, determining the Time of Week at the first bit of the sequence of predicted navigation bits; and

coincident with the first bit of the sequence of predicted navigation bits, setting coarse GPS time within the GPS receiver responsive to the predicted SUB-FRAME COUNT and the time of receipt.

13. The method of claim 12 further comprising determining an expected error in the Time of Week; and the step of setting coarse GPS time further includes setting the expected error.

14. The method of claim 13 wherein the predicted SUB-FRAME COUNT value is defined with regard to a weekly time reference, and the step of determining the Time of Week comprises computing a Bit of Week corresponding to the number of bits elapsed from the weekly time reference until the first bit of the sequence of predicted navigation bits, responsive to the predicted SUB-FRAME COUNT value and the position of the first bit of the sequence of predicted navigation bits.

15. The method of claim 14 wherein the step of computing a Bit of Week comprises determining if the first bit of the sequence of predicted navigation bits is in the same subframe as the SUB-FRAME COUNT field, and responsive thereto, adjusting the predicted SUB-FRAME COUNT value.

16. The method of claim 12 further comprising, responsive to the coarse GPS time and the predicted navigation bits, performing a Pattern Match Algorithm to provide precise GPS time.

17. The method of claim 12 wherein the MS and the base station are communicating using a GSM system.